

## A Systematic Study on the Marine Sponges in Korea 8. Tetractinomorpha

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### 한국산 해산 해면류의 계통분류학적 연구 8. 사축해면류

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### 적 요

한국산 사축해면류의 분류학적 연구를 위해 1988년 부터 1989년 10월 까지 삼면연안과 14개 도서지방에서 채집된 표본과 그동안 한남대학교 생물학과에 미해결 종으로 보관되어 있던 표본들을 동정, 분류한 결과 4과 8속 15종이 분류되었다. 이중 10종은 한국 미기록종이고 5종은 신종으로 밝혀졌다. 한국 미기록종과 신종에 대하여만 특기 또는 기재와 도판을 첨가하였다.

Key words: systematics, marine sponges, Tetractinomorpha, Korea.

## INTRODUCTION

Sixty-six species of Korean marine Tetractinomorpha sponges have been recorded from Korean waters. (Kim et al., 1968; Rho et al., 1969; Rho & Sim, 1972 a, 1972b, 1976, 1979, 1981; Rho & Lee, 1976; Sim, 1981, 1982; Sim & Kim, 1988)

The present study is based on the materials which were collected from 14 localities in Korea during the period from 1988 to 1989 (Fig. 1), and some unidentified specimens which have been preserved in the Department of Biology, Han Nam University. The identified Tetractinomorpha consist of 15 species,

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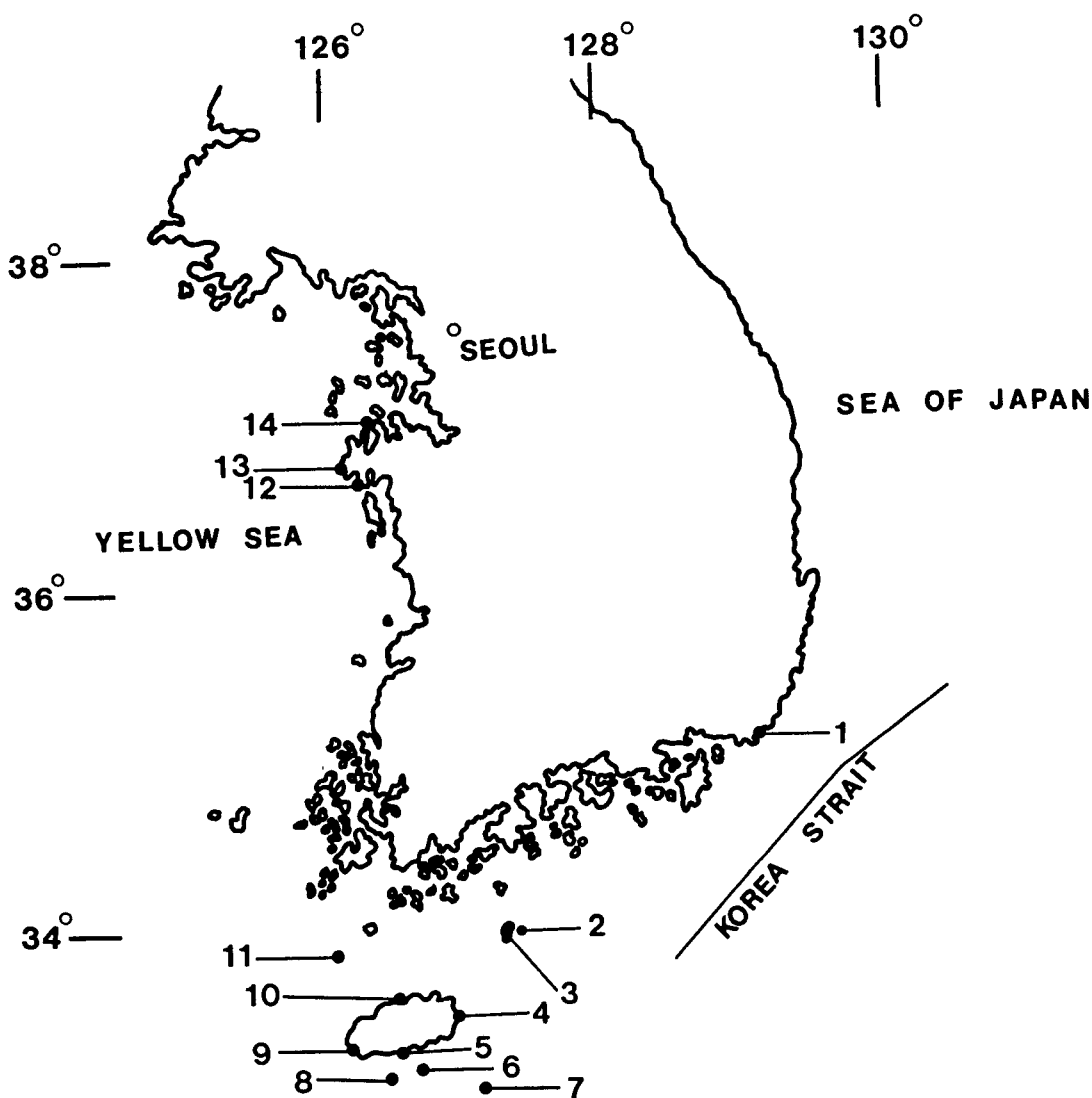


Fig. 1. A map showing the localities where the specimens were collected. 1, Mip'o; 2, Södo; 3, kómundo; 4, Söngsanp'o; 5, Sögwip'o; 6, Supšöm; 7, 33°00'00" N, 127°30'00" E; 8, Pömsöm; 9, Moseulp'o; 10, Cheju Harbo; 11, Ch'ujado; 12, Anhüng; 13, Mallip'o; 14, Karoyrn Bay.

8 genera and 4 families. of those, five species are new to science and 10 species are newly recorded from Korean waters

## SYSTEMATIC ACCOUNT

The species marked with an asterisks (\*) indicate new records in Korea and two asterisks (\*\*) indicate new species

Class Demospongia Sollas, 1885	보통해면 강
Subclass Tetractinomorpha Levi, 1956	사축해면 아강
Order Choristida Sollas, 1880	코리스티다해면 목
Family Geodiidae Gray, 1867	조디아해면 과
Genus <i>Erylus</i> Gray, 1888	꼭지해면 속

**\*1. *Erylus placenta* Thiele, 1898** 태반꼭지해면 (신칭) (Pl. 1, Figs. 1-2)

*Erylus placenta* Thiele, 1898 (pp. 5-6, Pl. 1, fig. 1 & Pl. 6, figs. 1 a-h).

**Material examined:** Söngsanp'o, 15/VII/1982.

**Remarks:** This sponge massive and size up to  $10 \times 9 \times 0.8$  cm. Surface with many wrinkles and texture is hard and fragile. Pores dispersed on the body. Colour in spirits ivory.

Spicules: Oxea .....	802-905 $\times$ 18-25 $\mu$ m.
Orthotriaene .....	clad: 150-182 $\times$ 20-35 $\mu$ m.
	rabdome: 575-616 $\times$ 25-38 $\mu$ m.
Sterraster .....	125-153 $\mu$ m.
Micro oxea .....	43-53 $\mu$ m.
Oxyaster .....	35-43 $\mu$ m.

**Distribution:** Korea (Cheju Island), Japan (Kako-sima Bay, Kyushu).

**\*2. *Erylus nobilis* Thiele, 1900** 유명꼭지해면 (신칭) (Pl. 2, Figs. 1-2; Pl. 3, Figs. 1-5)

*Erylus nobilis* Thiele, 1900 (pp. 48-49, Pl. 2, fig. 17)

*Erylus nobilis*: Lendenfeld, 1910 (p. 318).

**Material examined.** Mosŭlp'o (fish net), 18/VII/1987.

**Remarks:** This sponge a mass. Surface uneven and covered with about 0.5mm thick epidermis. Oscules rare, size up to 2mm in diameter. Texture hard. Sterraster in epidermis and orthotriaene in endosome.

The species is similar to *Erylus placenta* Thiele, 1898 in spicule type, but differs from the latter in form.

Spicules: Oxea .....	785-1183 $\times$ 27-40 $\mu$ m.
Orthotriaene .....	clad: 173-200 $\times$ 27-40 $\mu$ m.
	rabdome: 426-665 $\times$ 23-40 $\mu$ m.
Sterraster .....	120-160 $\mu$ m.
Microoxea .....	47-67 $\mu$ m.
Oxyaster .....	26-43 $\mu$ m.

**Distribution:** Korea (Cheju Island), Banda Sea and Timor Sea.

Order Lithistida Schmidt, 1870	리티스티다해면 목
Family Kaliapsidae De Laubenfels, 1836	돌해면 과
Genus <i>Discodermia</i> Bocage, 1869	가죽해면 속

**\*3. *Discodermia emarginata* Dendy, 1905** 유두가죽해면 (신칭) (Pl. 4, Figs. 1-2)

*Discodermia emarginata* Dendy, 1905 (pp. 99-101, Pl. 4, fig. 4).

*Discodermia emarginata* var. *lamellaris*: Wilson, 1925 (p. 455. Pl. 43, fig. 5).

*Discodermia emarginata*: Burton, 1959 (p. 216).

**Material examined:** Munsŏm (Cheju Island), 26/XII/1986

**Remarks:** This sponge of small massive form. The upper surface convex and mammiform. Texture compact and stony. Colour in life gold but pale yellow in spirits.

**Spicules:** Oxea ..... 399-831  $\times$  3-5  $\mu$ m.  
 Desma ..... 269-333  $\times$  17-49  $\mu$ m.  
 Young crepis ..... 93-149  $\times$  7-9  $\mu$ m.  
 Discotriaen ..... 120-166  $\mu$ m.  
 Microstrongyle ..... 13-16  $\mu$ m.

**Distribution:** Korea (Cheju Island), Ceylon, and Philippines.

**\*4. *Discodermia gorgonoides* Burton, 1928** 납작가죽해면 (신칭) (Pl. 4, Figs. 3-4)

*Discodermia gorgonoides* Burton, 1928 (pp. 109-110, text-fig. 1).

**Material examined:** Sŏgwip'o, 1/VII/1984.

**Remarks:** This specimen plate in form. Surface uneven. Pores dispersed on the body. Texture stony. Colour in spirits pale grey. Microstrongyle very rare.

**Spicules:** Oxea ..... 200-333  $\times$  4-9  $\mu$ m.  
 Desma ..... 519-599  $\times$  47-53  $\mu$ m.  
 Discotriaen ..... 214-346  $\mu$ m.  
 Microstrongyle ..... very rare, 96  $\mu$ m.

**Distribution:** Korea (Cheju Island) and Indian Ocean.

Genus *Lophacanthus* Hentschel, 1912 빨해면 속

**\*5. *Lophacanthus rhabdophorus* Hentschel, 1912** 빨해면 (신칭) (Pl. 5, Figs. 1-2)

*Lophacanthus rhabdophorus* Hentschel, 1912 (pp. 306-307, Pl. 17, fig. 1).

**Material examined:** Munsŏm (Cheju Island), 26/XII/1986.

**Remarks:** The sponge thin, encrusting on the rock. Surface rough because small conical protuberances. Texture stony and Colour in spirits dark brown. This specimen has Lophotriaene desma.

**Spicules** Style ..... 639-865  $\times$  3-20  $\mu$ m.  
 Desma ..... 226-300  $\times$  11-27  $\mu$ m.  
 Lophotriaen desma ..... 173-287  $\times$  20-27  $\mu$ m.

**Distribution:** Korea (Cheju Island), Arafura-see

Order Hadromerida Topsent, 1894 경해면 목

Family Suberitidae Schmidt 코르크해면 과

Genus *Polymastia* Bowerbank 다공해면 속

**\*6. *Polymastia clavata* Burton, 1959** 종다공해면 (신칭) (Pl. 5, Figs. 3-4)

*Polymastia clavata* Burton, 1959 (pp. 207-208, text-fig. 9).

**Material examined:** Mosŭlp'o (fish net), 19/VII/1987.

**Remarks:** This sponge round form but slightly flat, blind papillae, size up to 7.5  $\times$  6.5  $\times$  1 cm. Surface even and texture is soft and flexible. Oscules not apparent. Colour in life yellow but in spirits

white. The species differs from all known species of genus *polymastia* in its external form as well as in its spiculation. Particularly the species has hair-like tylostyli.

**Spicules:** Subtylostyle ..... 813-1010 × 7-12 μm.

Small tylostyle ..... 120-193 × 0.9-3 μm.

**Distribution:** Korea (Cheju Island), Arabian Sea.

Genus *Pseudosuberites* Topsent, 1900 의코르크해면 속

**\*7. *Pseudosuberites kunisakiensis*** Hoshino, 1981 쿠니사의코르크해면 (신칭) (Pl.6, Figs. 1-3)

*Pseudosuberites kunisakiensis* Hoshino, 1981 (p. 226, fig. 15, Pl. 2, fig. 6).

**Material examined:** Sŏgwip'o, Cheju Univ. Marine Biological laboratory, 2/VII/1984.

**Remarks:** This sponge is small fragment. Texture is very soft and fragile. Oscules are not observed. Colour in spirits is whitish - yellow.

**Spicules:** Large tylostyle ..... 228-335 × 6-8 μm.

Small tylostyle ..... 160-213 × 3-6 μm.

**Distribution:** Korea (Cheju Island), Western Japan (Uwajima), Kurotsusaki (Kunisaki Pen).

Order Axinellida Bergquist, 1970

축해면 목

Family Axinellidae Ridley & Dendy, 1888

축해면 과

Genus Axinella Schmidt, 1862

축해면 속

**\*8. *Axinella rugosa*** (Bowerbank, 1866) 주름축해면 (신칭)

(Pl. 7, Figs. 1-2)

*Dictyocylindrus rugosus* Bowerbank, 1866 (p. 119).

*Phakellia rugosus*: Fristedt, 1887 (p. 461).

*Axinella rugosa*: Koltun, 1959 (p. 230, fig. 154).

**Material examined:** Mosŭlp'o (fish net), 19/VII/1987.

**Remarks:** This sponge irregular, massive, size up to 8-10 cm. Surface uneven because of hispid spicule. Texture hard and elastic. Oscules sparse and measure up to 2-3mm in diameter. Colour in life brownishred, but in spirits pale brown. Oxea and Style frequently curved. Strongyle uncommon.

**Spicules:** Style ..... 585-1264 × 11-33 μm.

Oxea ..... 798-1091 × 7-33 μm.

Strongyle ..... 592-1024 × 13-40 μm.

**Distribution:** Korea (Cheju Island), South western Barents Sea, Bering Sea (near the Aleutian Islands), Sea of Japan (near shores of Japan, Vladimir Bay), Greenland and Norwegian Seas (near the Shetland Islands).

**\*9. *Axinella hispida*** Koltun, 1959 털보축해면 (신칭)

(Pl. 8, Figs. 1-2)

*Axinella hispida* Koltun, 1959 (pp. 232-233, fig. 156).

**Material examined:** Cheju Harbor, 6/II/1986.

**Remarks:** The body elongated, branching, slightly lobate, size up to 18cm in height. The surface uneven, markedly spiculated. Texture strong, elastic. Colour in spirits pale grey. The sponge dermal membrane specialization. The species resembles *Axinella rugosa* (Bowerbank). It differs from the former in that it lacks distorted strongyle in its skeleton.

Spicules: Sinuous oxea ..... 549-1197  $\times$  32-37  $\mu\text{m}$ .  
 Style ..... 635-1091  $\times$  31-35  $\mu\text{m}$ .  
 Distribution: Korea (Cheju Island), Bering Sea (near the Komandorskii Islands).

**\*10. *Axinella hispida gracilis* Halmann, 1914** 털보가지축해면 (신칭) (Pl. 8, Figs. 3-4)

*Axinella hispida gracilis* Halmann, 1914 (pp. 417-421, Pl. 23, fig. 1; Pl. 22, fig. 7; text-fig. 17).

Material examined: Karoym Bay, 1/XI/1980.

Remarks: This specimen erect, arborescent, bushy shape, composed of a number of cylindrical branches. The main branch somewhat flattened and measures about 8mm in thickness. Total height of the specimen about 16cm. Surface coarsely hispid to the naked eye; Oscula and pores not apparent. Colour in spirits pale grey. Texture tough and resilient.

Spicules: Subtylostyle ..... 665-1077  $\times$  5-9  $\mu\text{m}$ .  
 Style ..... 789-998  $\times$  7-11  $\mu\text{m}$ .  
 Oxea ..... 259-772  $\times$  2-10  $\mu\text{m}$ ,  
 Acanthostyle ..... 53-67  $\times$  3-5  $\mu\text{m}$ .

Distribution: Korea (Yellow Sea), Tasman Sea.

**\*\*11. *Axinella columna* sp. n.** 기둥축해면 (신칭) (Pl. 9, Figs. 1-2)

Holotype: Han Nam univ. Mus. Por. 7.

Material examined: Mosulp'o in Korea strait, 18/VII/1987. H.Y. Kim & H.S. Byeon.

Description: This sponge thick pillar shape and has short stalk, size up to 8 $\times$ 5 $\times$ 1cm. Texture tough and elastic. Surface of the body superficially velvety and has no dermal membrane. colour in spirits in grey. Spicules very large.

Spicules: Oxes ..... 1776-2022  $\times$  12-27  $\mu\text{m}$ .  
 Style ..... 1663-2476  $\times$  16-17  $\mu\text{m}$ .

Remarks: Style and oxea are longer than *Axinella hispida*. Strongyle are commonly lacking. *Axinella hispida* differs from this species in external appearance has dermal thin membrane. Surface is extremely hispid with the projecting long dermal spicules brushes, but similar in spiculation.

Etymology: The specific name columna (L: pillar) is based upon pillar shape of the new species.

**\*\*12. *Axinella cornua* sp. n.** 사슴뿔축해면 (신칭) (Pl. 9, Figs. 3-4)

Holotype: Han Nam univ Mus. por. 8 (pl. 9, figs. 3-4)

Material examined: Mallip' O, 6/VII/1979, S.K. Kim & M.H. Lee.

Description: This sponge is erect, stipitate with cylindrical pointed dichotomy branches and anastomose at points of contact so resembling deer antler. The sponge size up to 2-8cm in height and attached to rocks. Surface rough because of protruding spiculs and texture tough. Colour in spirits pale brawn.

Spicules: oxea ..... 1080-1281  $\times$  3-8  $\mu\text{m}$ .  
 Sinuous oxes ..... 585-1120  $\times$  8-9  $\mu\text{m}$ .  
 Style ..... 639-831  $\times$  5-11  $\mu\text{m}$ .  
 Strongyle ..... 968-1130  $\times$  13-17  $\mu\text{m}$ .

Remarks: *Axinella aurantiaca* (Halmamn. 1914) differs from this species in spiculation. This species characterized by sinuous oxea, which are extremely and irregular bent. external form of this sponge very closely resembling *A. aurantiaca*.

**Etymology:** The specific name cornua (L: antler) is based upon deer antler shape of the new species.

Genus *Acanthella* schmidt, 1862    가지해면 속

**\*\*13. *Acanthella branchia* sp. n.**    빨가지가지해면 (신칭)    (Pl. 10, Figs. 1-2)

**Holotype:** Han Nam univ Mus. por. 11

**Material examined:** Komundo, 25/VII/1988 Byeon, H.S.

**Description:** This sponge elect and has several branches stand upwards, from which branches connected by thin web-like dermal membrane between them. Surface has numerous hispidate processes like gill. show an irregular plumose appearance and attached to substratum by it distal end, forming a thin wide disc. Total height 10cm and breadth 3.6 cm.

**Spicules:** Style ..... 442-1111 × 9-2  $\mu\text{m}$ .

Strongyle ..... 415-572 × 12-16  $\mu\text{m}$ .

**Remarks:** *Acanthella vulgata* is very similar to this species in external appearance but differs from the present species in spicule size, strongyle is similar than *A. vulgata*'s species.

**Etymology:** The name branchia (GR: gill) based upon gill shape of the new species

Genus *Homaxinella* Topsent, 1917    둥근촉해면 속

**\*\*14. *Homaxinella arbora* sp. n.**    나무동 촉해면 (신칭)    (Pl. 10, Figs. 3-4)

**Holotype:** Han Nam Univ. Mus. por. 12

**Material examined:** mosulp'o (fish net), 19/VII/1987. H.Y. KIM & H.S. Byeon.

**Description:** This sponge tough, flabellate form and about 6cm in height, 4.8cm in width. The surface extruded with a nervate bundle of spicules. The colour pale yellow in spirit. Skeleton axial form. The spicules consist of two types of style.

**Spicules:** Stout style ..... 878-1396 × 24-28  $\mu\text{m}$ .

Slender style ..... 851-1383 × 13-17  $\mu\text{m}$ .

**Remarks:** This new species is similar to *Homaxinella echidnaea* (Ridley, 1884) in spicule, but differs in shape. *H. echidnaea* is highly, branched form, whereas new species is flabelliform. In texture, *H. echidnaea* is very hard, but the new species tough.

**Etymology:** The name arbora (L: tree) is based upon tree shape of the new species

Genus *Bubaris* Gray, 1867    꽃가지해면 속

**\*\*15. *Bubaris ramus* sp. n.**    꽃가지 해면 (신칭)    (Pl. 11 Figs. 1-4)

**Holotype:** Han Nam univ. Mus. por. 13

**Paratype:** Han Nam univ Dept of Biol. por. 13-1.

**Material examined:** Two specimens, Mosulp'o (fish net) 19/VII/1987, H.T. Kim

**Description:** This sponge about 13cm in height, 5.5cm in width and has branches, with some oscules, 1mm in diameter the distal portion flattened. The colour orange in life and pale yellow in spirit. Distal portion and proximal portion of sponges soft and hard respectively.

**Spicules:** Strongyle ..... 239-998 × 9-13  $\mu\text{m}$ .

Oxea ..... 266-771 × 8-16  $\mu\text{m}$ .

Style ----- 226-426 × 8-13  $\mu\text{m}$ .

**Remarks:** This sponge is similar to *Bubaris durissimma* Burton (1928) in spicule type, but differs in shape. The new species is thinner than the *B. durissima* and *B. ramus* has no spines on the surface. The oscules and pores are visible in the new species, but not in *B. durissimma*. In texture, *B. durissimma* is hard while this species is soft, particularly at the distal portion.

**Etymology:** The specific name *ramus* (L.: branch) is based upon "to have many branches of the new species."

## ABSTRACT

The identified Tetractinomorpha consist of 15 species 8 genera and 4 families. Among them, five species, *Axinella cornua*, *Axinella columna*, *Acanthella branchia*, *Homaxinella arbora*, *Bubaris ramus* are new species and the following one are new to Korea; *Erylus placenta* Thiele, 1898; *Erylus nobilis* Thiele, 1900; *Discodermia emarginata* Dendy, 1905; *Discodermia gorgonoides* Burton, 1928; *Lophacanthus rhabdophorus* Hentschel, 1912; *Polymastia clavata* Burton, 1959; *Pseudosuberites kunisakiensis* Hoshino, 1981; *Axinella rugosa* (Bowerbank, 1866); *Axinella hispida* Koltun, 1959; *Axinella hispida gracilis* Hallmann, 1914.

## REFERENCES

- Bowerbank, J. S., 1866. A monograph of the British Spongiidae. II. *Ray. Soc., London*, **2** (1): 1-388.
- Bowerbank, J. S., 1874. A monograph of the British Spongiidae III. *Ray. Soc. London*. 1-360. cited from Fristedt, 1887.
- Burton, M., 1928. Report on some deep-sea sponges from the Indian Museum collected by the R.I.M.S. Investigator. *Rec. Ind. Mus.*, **1** (30): 109-138.
- Burton, M., 1959. Sponges. The John Murray Expedition 1933-34. *Sci. Rep. John Murray Exped.* **10** (5): 150-281.
- Dendy, A., 1905. Report on the sponges collected by professor Herdman at Ceylon in 1902. *Rep. Pearl Oyster Fish. Gulf of Manaar*, **3**, *Suppl.*, **18**: 57-246.
- Fristedt, K., 1887. Sponges from the Atlantic and Arctic Oceans and the Behring Sea. *Vega-Exped. Vetensk. Iaktt. (Nordenskiöld)* **4**: 401-471.
- Hallmann, E.F., 1914. A revision of the monaxonid species described as new in Lendenfeld's "Catalogue of the Sponges in the Australian Museum." *Proc. Linn. Soc. New South Wales*, **1** (34): 263-315, 2: 327-376, 3: 398-446.
- Hentschel, E., 1912. Kiesel und Hornschwämme der Aru- und Kei Inseln. *Abh. Senckenb. Ges.*, **34**: 295-448.
- Hentschel, E., 1929. Die Kiesel- und Hornschwämme des Nordlichen Eismers. *Fauna Arctica*, **5**: 859-1042.
- Hoshino, T., 1981. Shallow-water Demosponges of western Japan. II. *J. Sci. Hiroshima Univ., Ser. B, Div. 1 (Zool.)*, **29** (2): 207-276.
- Koltun, V. M., 1959. Silicospongin sponges of the northern and far eastern Seas of the USSR—keys to the fauna of the U.S.S.R. *Opred. Fauna S.S.S.R.*, **67**: 1-236.
- Lambe, L. M., 1894. Sponges from the western coast of North America. *Proc. Trans. R. Soc. Canada*, **12** (4): 113-138.
- Lendenfeld, R. Von., 1910. Reports on the scientific results of the expedition to the eastern tropical Pacific, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross", from October, 1904, to March, 1905; Lieut. Commander L.M. Garrett, U.S.N., Commanding, and of other expedition of the "Albatross", 1888-1904. The



- Sponges. II. The Erylidae. *Mem. Mus. Comp. Zool.*, **41** (2): 267-323.
- Lundbank, W., 1909. The Porifera of East Greenland. *Mededel. Gronl.*, **29**: 423-464.
- Kim, H. S., B. J. Rho and C. J. Sim, 1968. Marine sponges in South Korea (I) *Korean J. Zool.* **11** (2): 1-11.
- Rho, B. J., H. S. Kim and C. J. Sim, 1969. Marine sponges in South Korea (2). *J. Korean Res. Inst Better Living. Ewha Woman's Univ.* **3**: 153-160.
- Rho, B. J. and C. J. Sim, 1972a. Marine sponges in South Korea (3). *Ibid.* **8**: 181-192.
- Rho, B. J. and C. J. Sim, 1972b. Faunal studies on the sponges in Korea. R-72-82. *Min. Sci. Tech.*, 121-138.
- Rho, B. J. and C. J. Sim, 1976. On the classification and the distribution of the marine benthic animals in Korea. 4. Sponges. *J. Korean. Res. Inst. Better Living, Ewha Woman's Univ.* **16**: 67-87.
- Rho, B. J. and K. H. Lee, 1976. A survey of marine sponge of Haeundae and its adjacent waters. *Ibid.*, **23**: 61-67.
- Ridley, S.O., 1884, Spongiida. Rep. 2001. collec. Indo pacific Ocean during voyage of H.M.S. Alert. 1881-82.
- Sim, C. J., 1981. A systematic study on the marine sponges in Korea. 1. Ceractinomorpha & Tetractinomorpha. *Soong Jun Univ. Eassays and Papers.*, **11**: 83-105.
- Sim, C. J., 1982. A systematic study on the marine sponges from Jeju Island.
- Sim, C. J. and M. H. Kim, 1988. A systematic study on the marine sponges in Korea. 7. Demospongia and Hexactinellida. *Korean J. Syst. Zool.*, **4** (1): 21-42.
- Thiele, J., 1898. Studien über Pazifische spongien I. *Zool.*, **24**: 1-72.
- Thiele, J., 1900 Kieselschwamme von Ternate. I. *Abh. Senckenb. Naturforsch. Ges.*, **25**: 19-80.
- Wilson, H. V., 1925. Silicious and horny sponges collected by the U.S. Fisheries Steamer "Albatross" during the Philippine Expedition, 1907-10. *Bull. U.S. Nat. Mus. Wash.* **100**, **2** (4): 273-506.

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## EXPLANATION OF PLATES 1-11

### Plate 1

**Fig. 1-2.** *Erylus placenta* Thiele

1. Entire animal
  2. Megasclere: A, oxea; B, orthotriaene
- Microsclere: C, sterraster  
D, early stage of sterraster  
E, microxea; F, oxyaster.

### Plate 2

**Figs. 1-5.** *Erylus nobilis* Thiele (SEM)

1. Entire animal
2. Megasclere; A, oxea B, orthotriaene

Microsclere: C, sterraster  
D, early stage of sterraster  
E, microxea; F, oxyaster.

### Plate 3

**Figs. 1-5.** *Erylus nobilis* Thiele (SEM)

1. Construction between endosome and ectosome (x60)
2. Orthotriaene (x150)
3. Surface of sterraster, early stage (x2200)
4. Surface of sterraster, fully developed (x3000)
5. Oxyaster (x1000)

**Plate 4****Figs. 1-2.** *Discodermia emarginata* Dendy

1. Entire animal
2. Megasciere: A, oxea; B, discotriaen  
C, young crepis  
D, desma  
Microsciere: E, microstrongyle.

**Figs. 3-4.** *Discodermia gorgonoides* Burton

3. Entire animal
4. Megasciere: A, oxea; B, discotriaen; C, desma  
Microsciere: D, microstrongyle

**Plate 5****Figs. 1-2.** *Lophacanthus rhabdophorus* Hentschel

1. Entire animal
2. Megasciere: A, large style; B, style  
C, slander style; D, desma  
E, lophotriaen desma

**Figs. 3-4.** *Polymastia clavata* Burton

3. Entire animal
4. Megasciere: A, Large subtylostyle  
B, subtylostyle; C, small tylostyle

**Plate 6****Figs. 1-2.** *Pseudosuberites kunisakiensis* Hoshino

1. Entire animal
2. Construction between endosome and ectosome (SEM, x150)
3. Megasciere: A, large tylostyle; B, small tylostyle

**Plate 7****Figs. 1-2.** *Axinella rugosa* (Bowerbank)

1. Entire animal
2. Megasciere: A, oxea; B, strongyle; C, style.

**Plate 8****Figs. 1-2.** *Axinella hispida* Koltun

1. Entire animal
2. Megasciere: A, sinous oxea; B, style.

**Figs. 3-4.** *Axinella hispida gracilis* Hallmann

3. Entire animal
4. Megasciere: A, subtylostyle; B, style; C, oxea  
Microsciere: acanthostyle

**Plate 9****Figs. 1-2.** *Axinella columna* sp. n.

1. Entire animal
2. Megasciere: A, style; B, oxea

**Figs. 3-4.** *Axinella cornua* sp. n.

3. Entire animal
4. Megasciere: A, oxea; B, sinous oxea; C, style  
D, strongyle.

**Plate 10****Figs. 1-2.** *Acanthella branchia* sp. n.

1. Entire animal
2. Megasciere: A, style; B, strongyle.

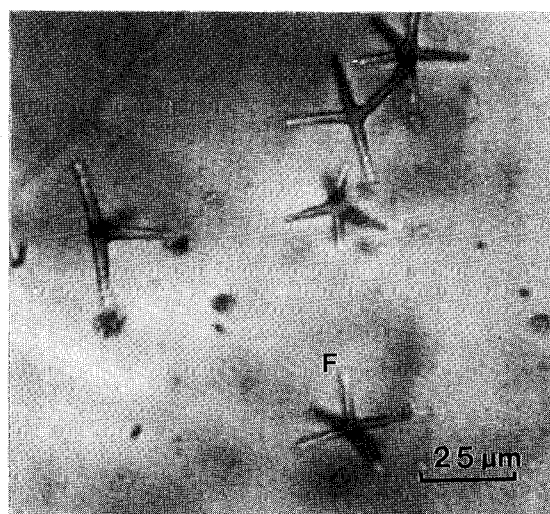
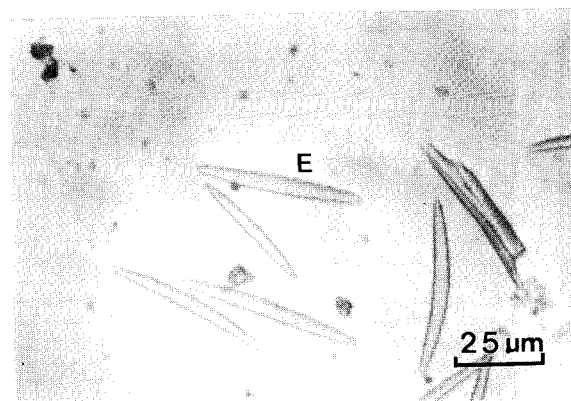
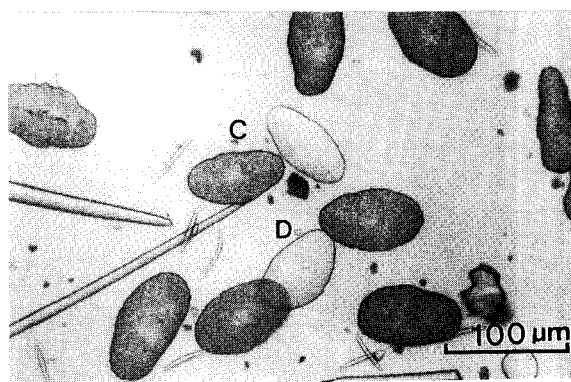
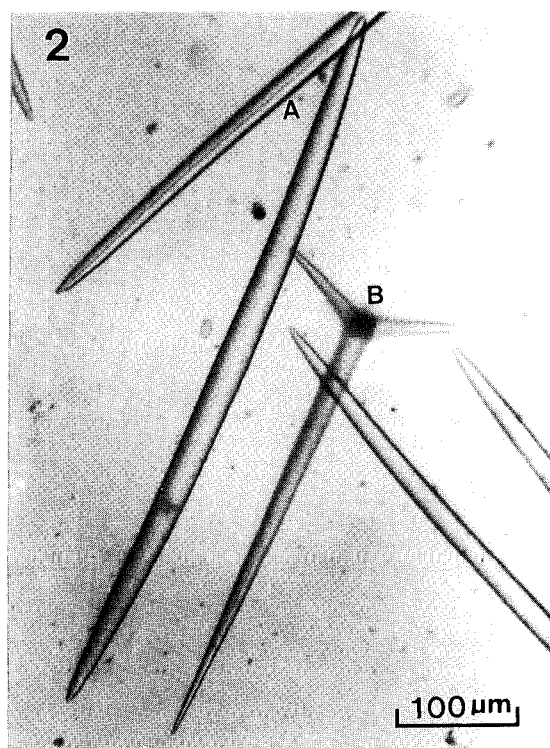
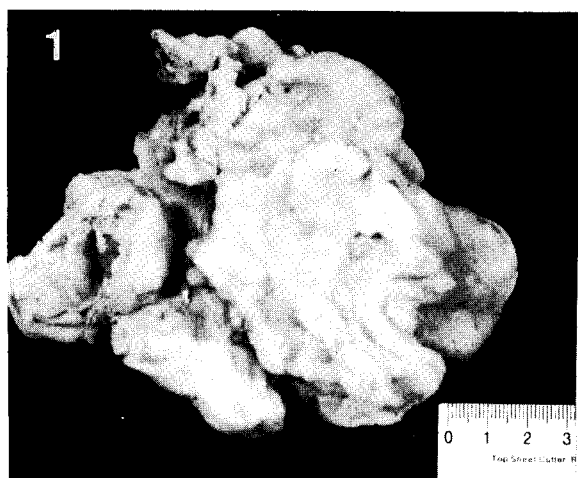
**Figs. 3-4.** *Homaxinella arborea*

3. Entire animal
4. External spines (SEM, x40)
5. Megasciere: A, stout style; B, slander style

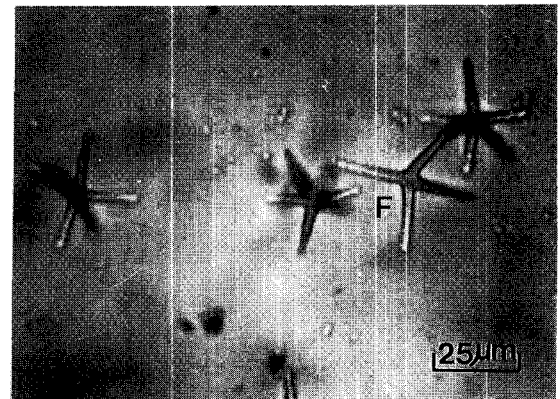
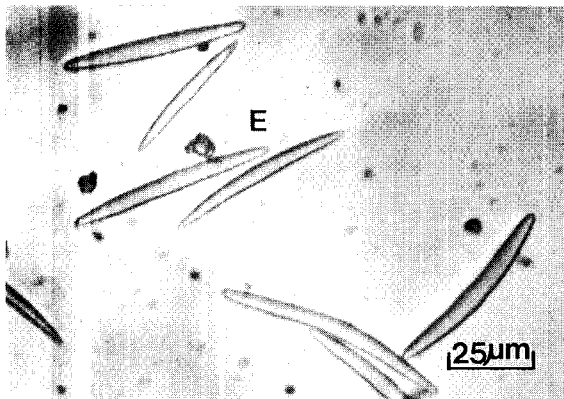
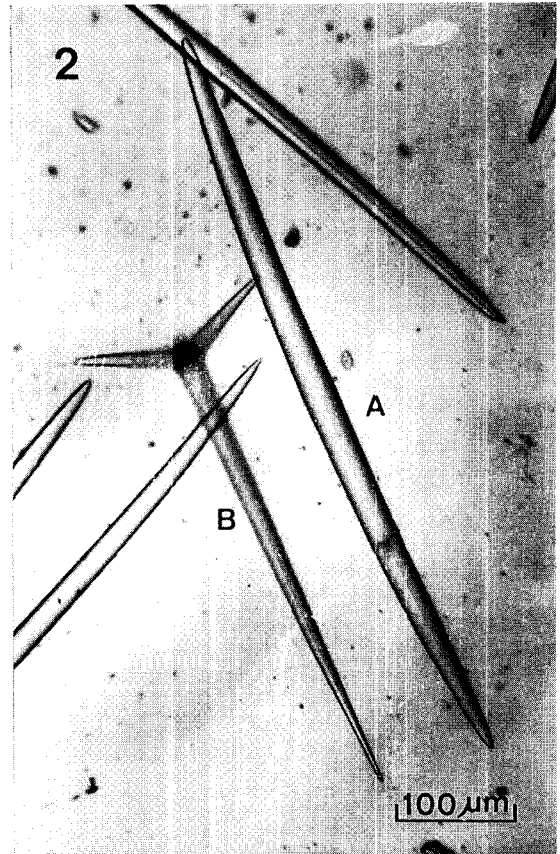
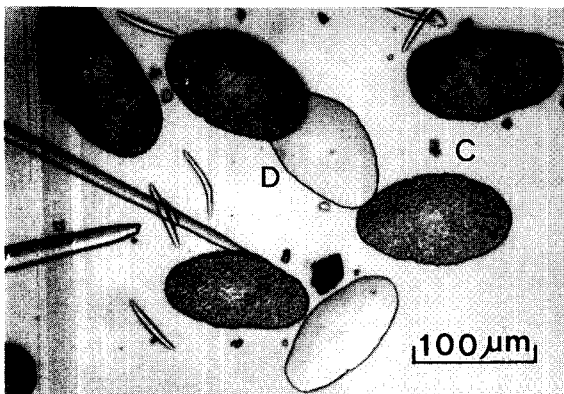
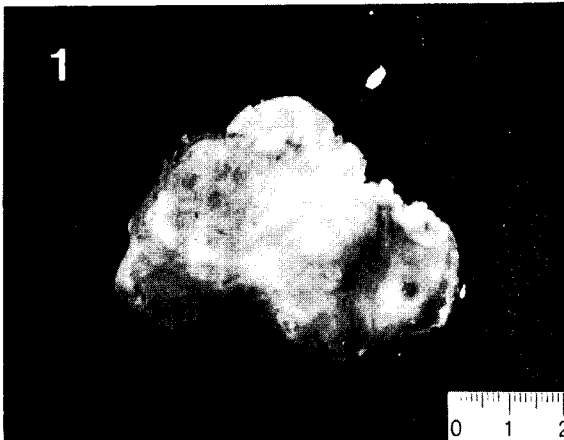
**Plate 11****Figs. 1-4.** *Bubaris ramus* sp. n.

1. Entire animal
2. Surface of the animal (SEM, x30)
3. Main skeleton (SEM, x30)
4. Megasciere: A, oxea; B, strongyle; C, style

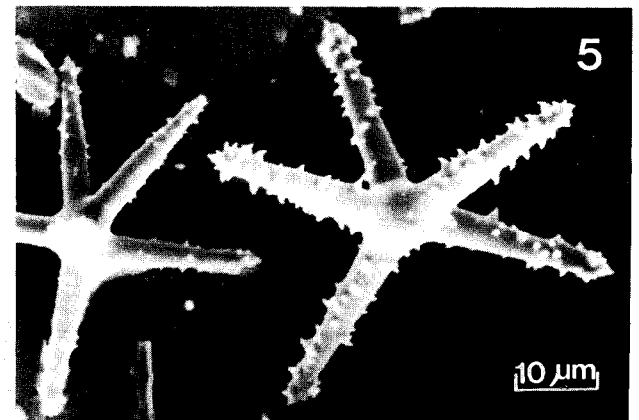
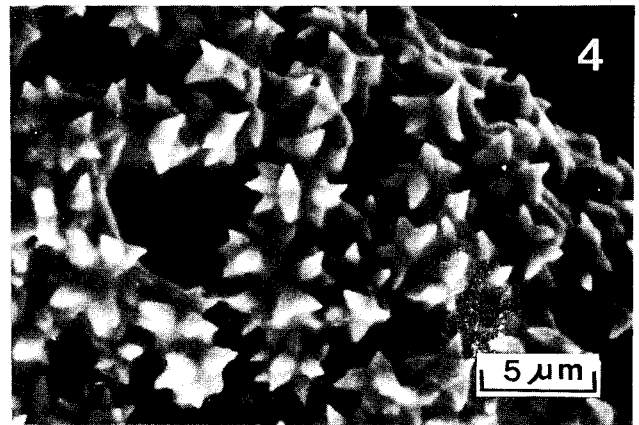
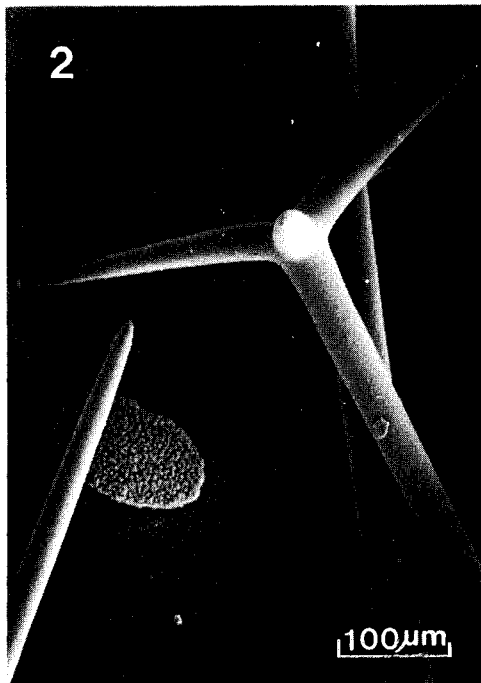
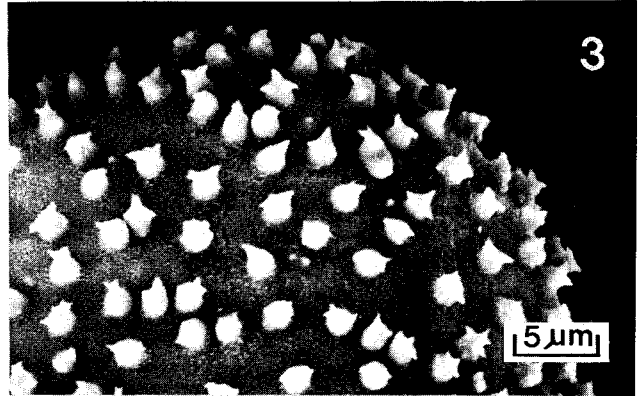
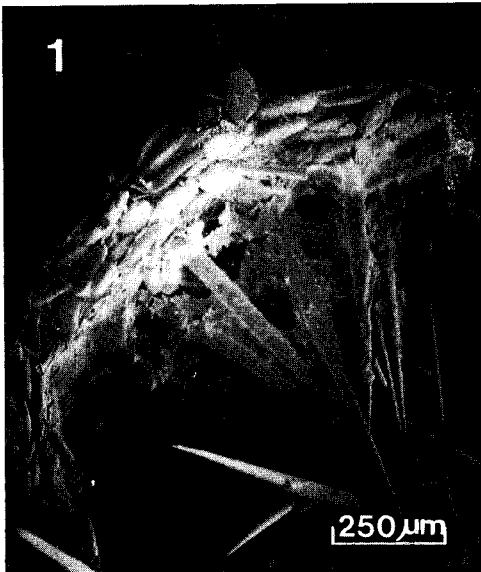
## PLATE 1



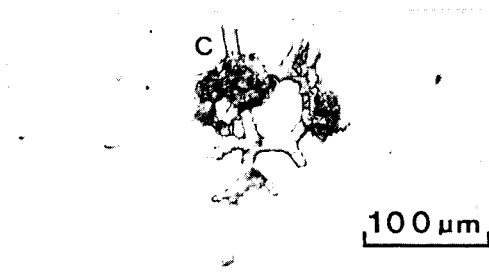
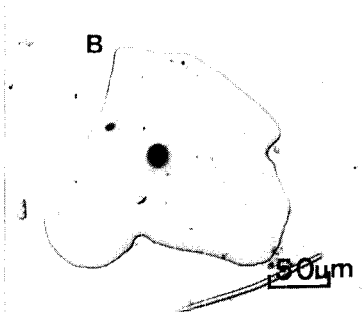
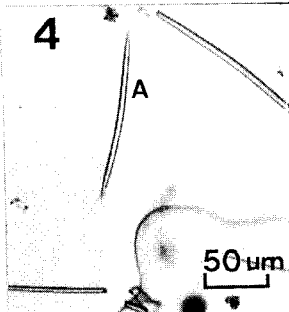
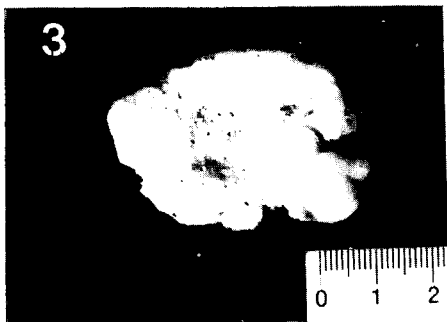
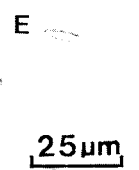
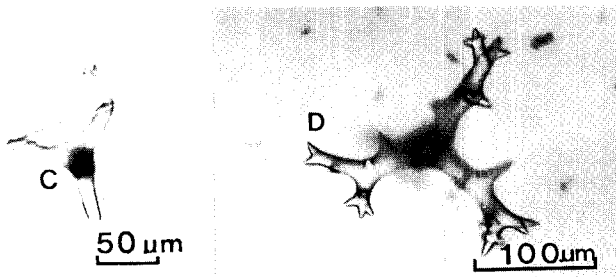
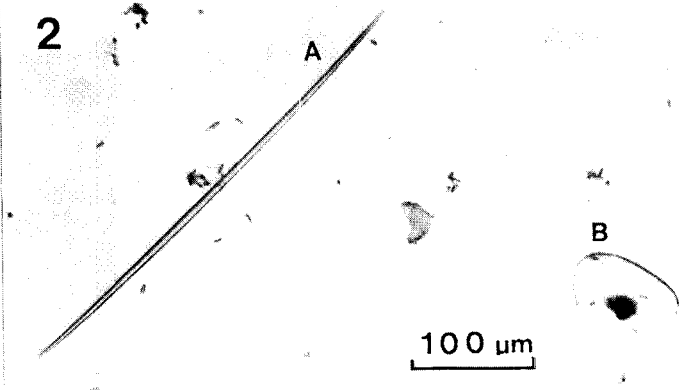
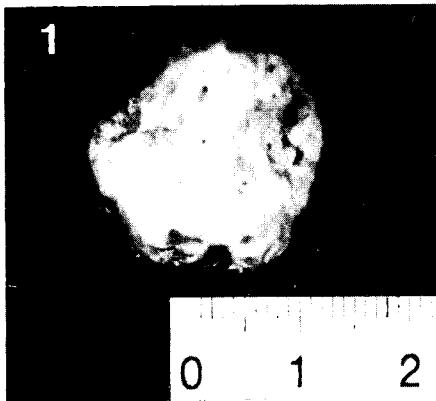
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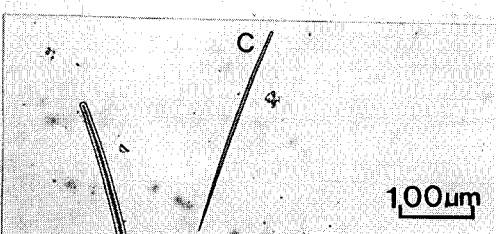
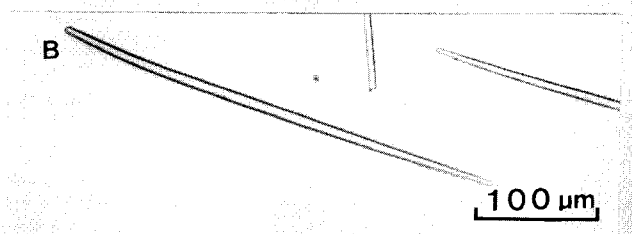
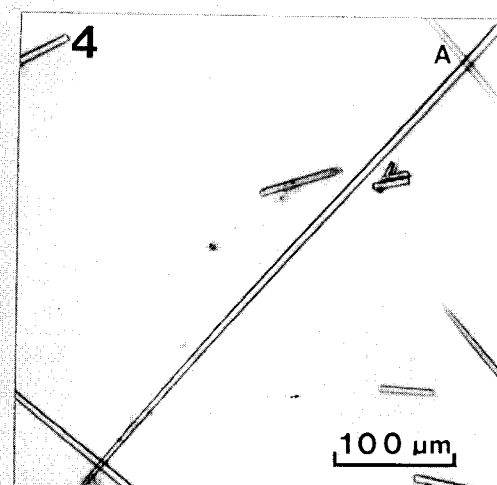
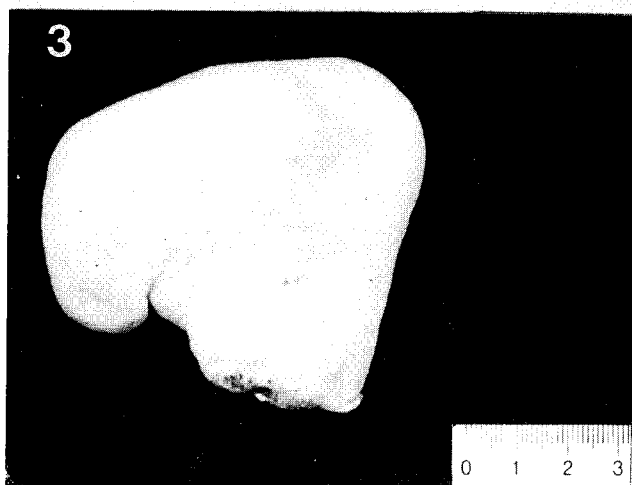
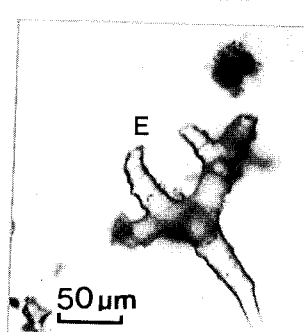
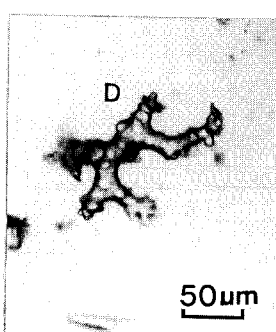
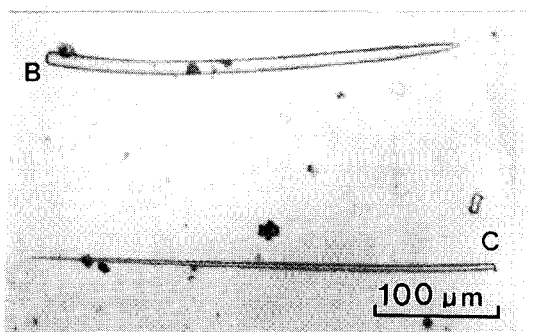
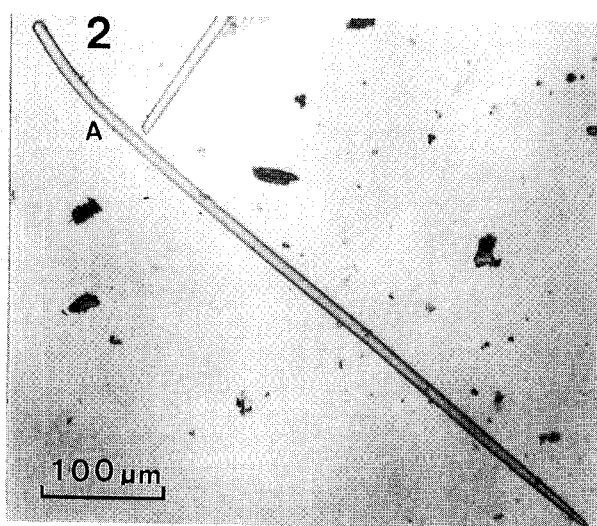
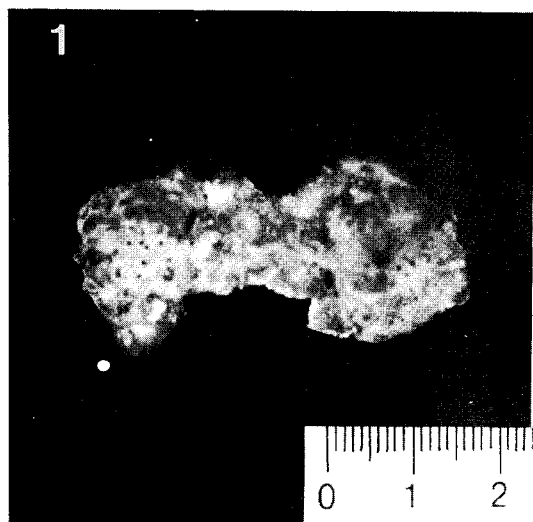
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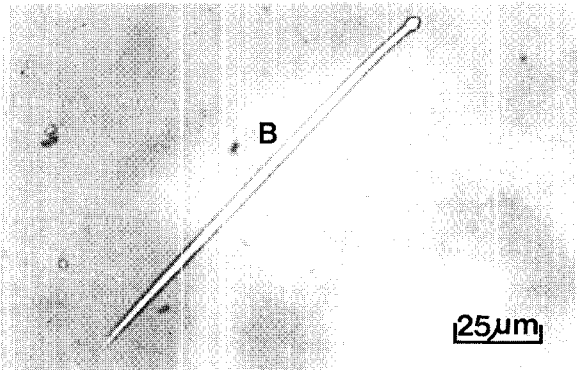
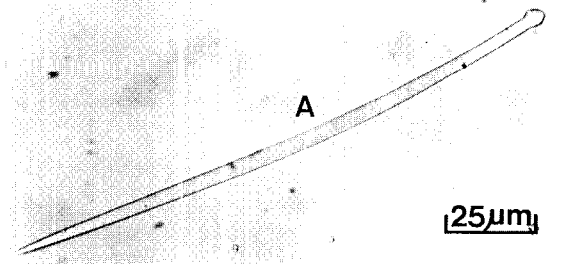
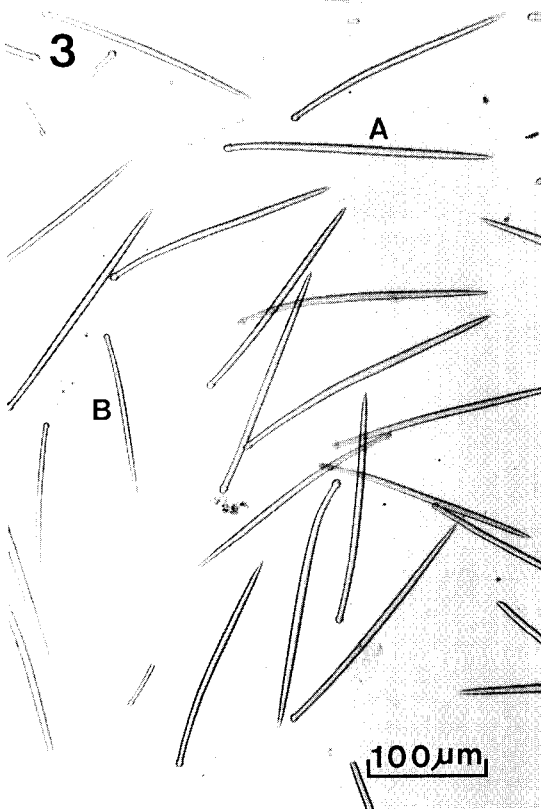
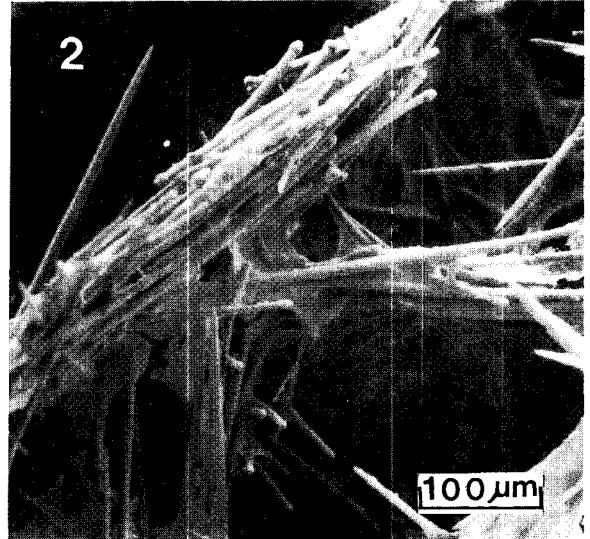
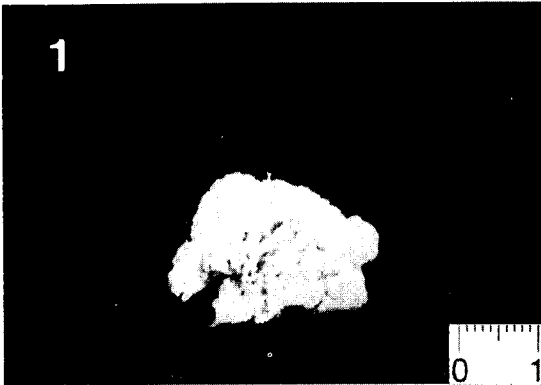
## PLATE 4



# PLATE 5

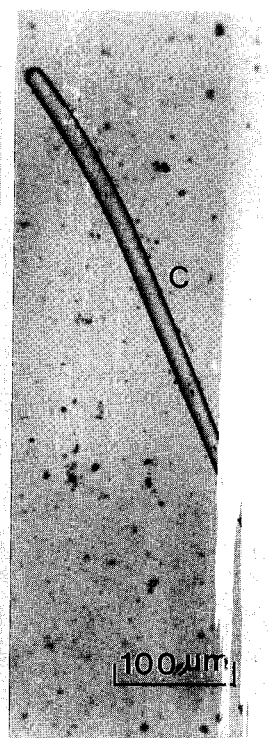
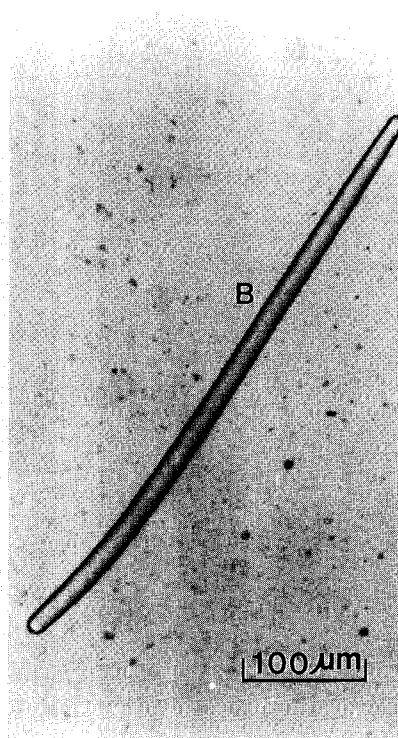
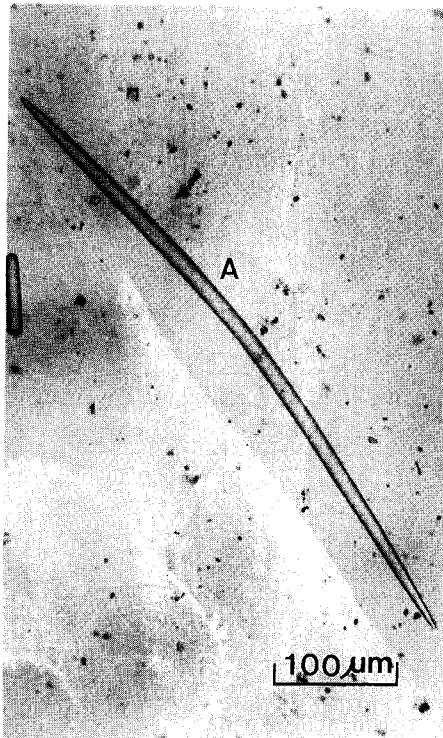
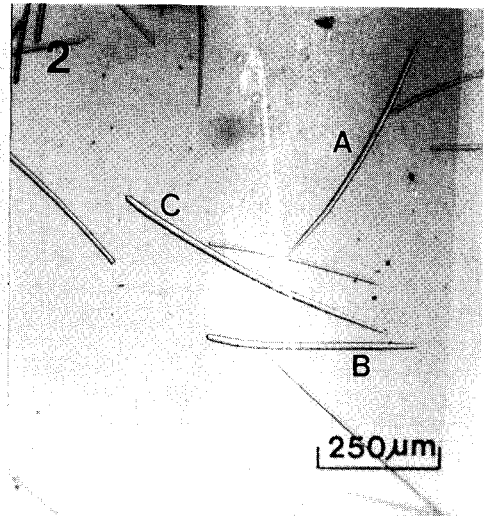
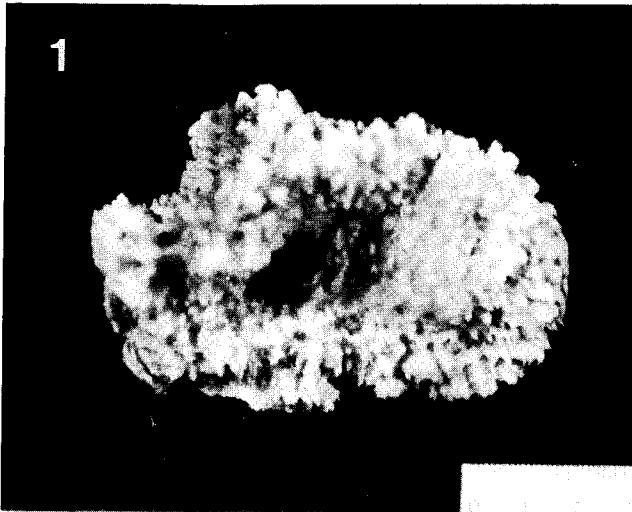


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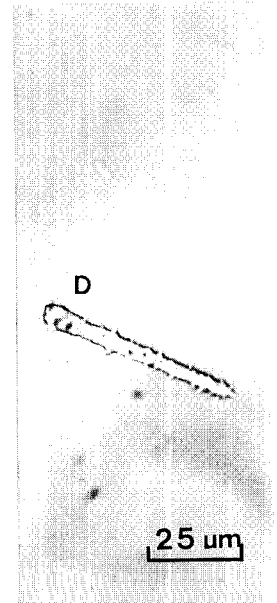
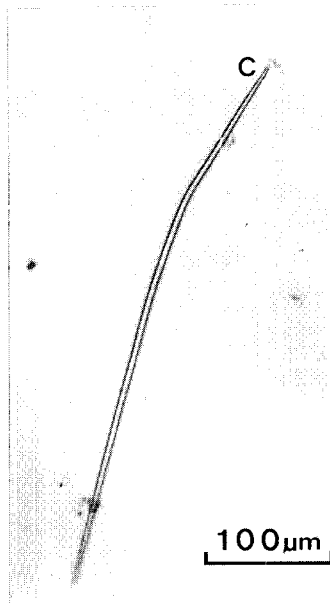
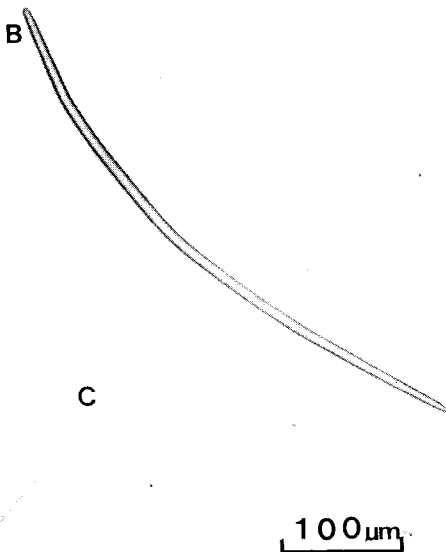
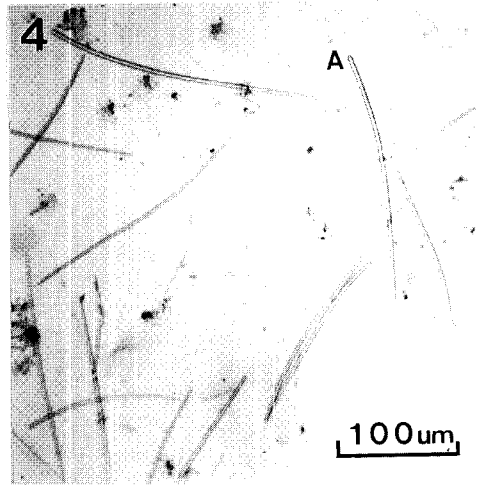
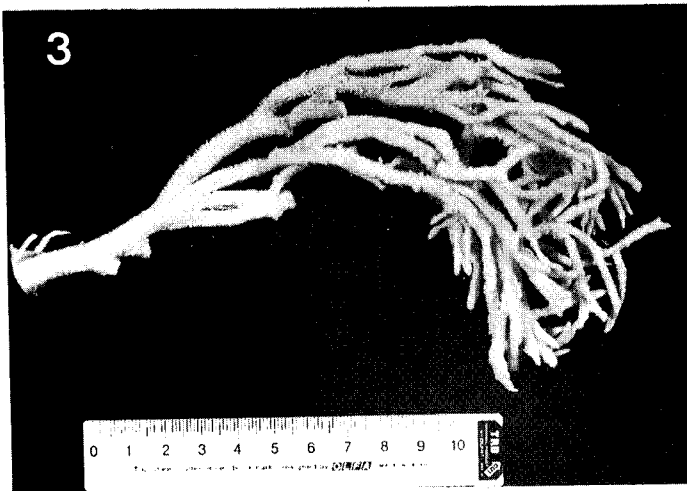
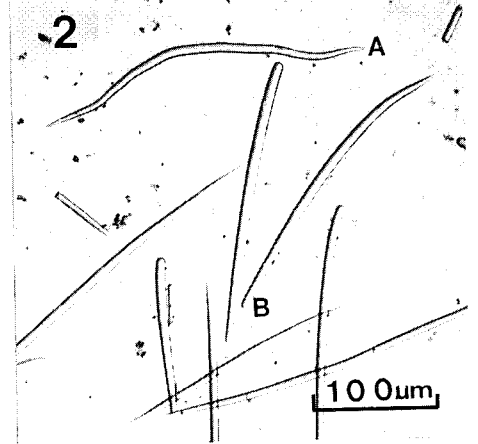
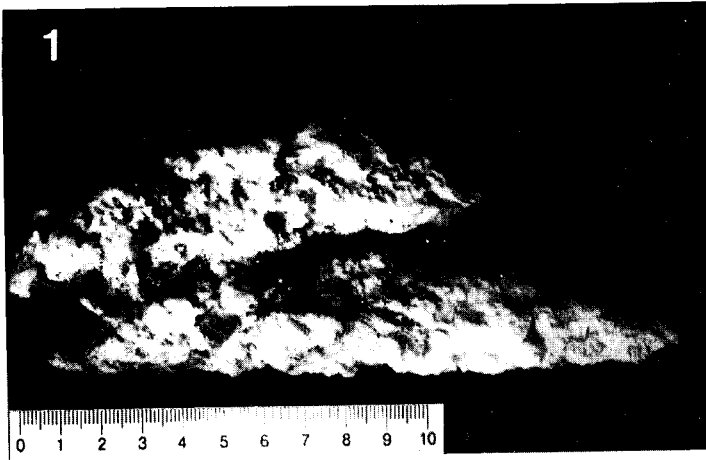


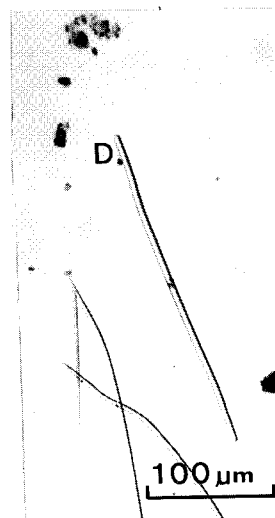
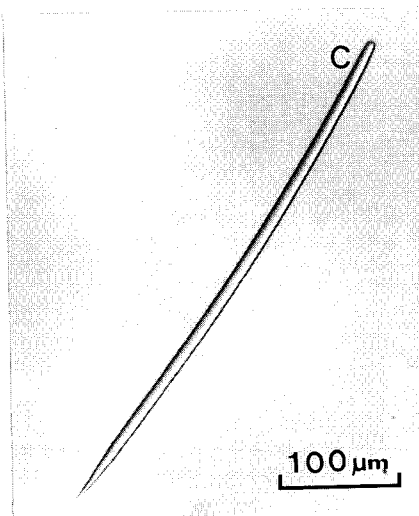
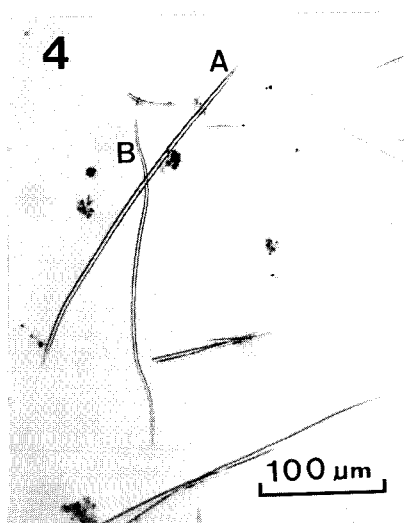
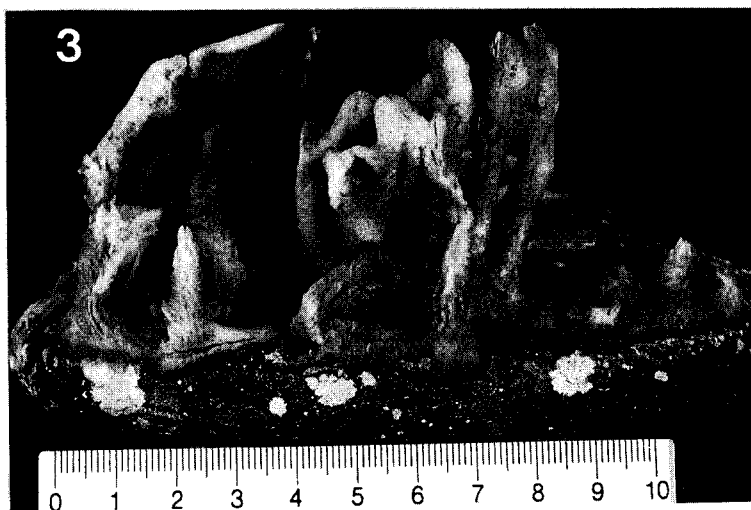
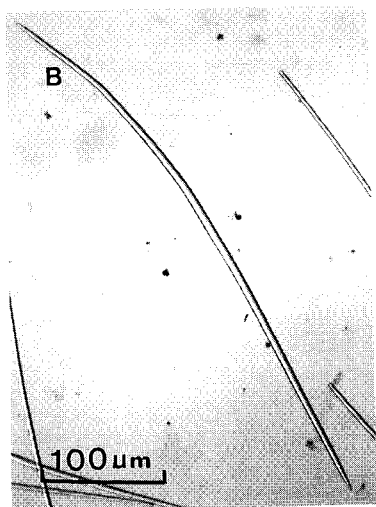
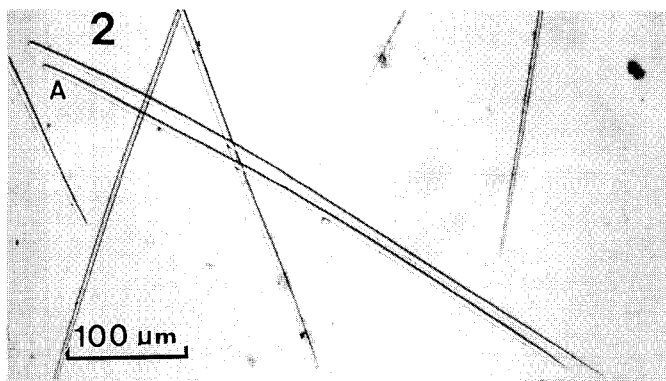


## PLATE 7

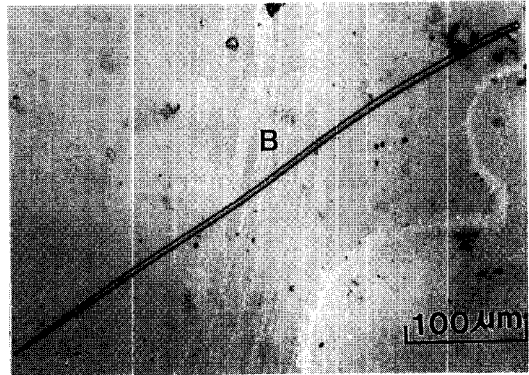
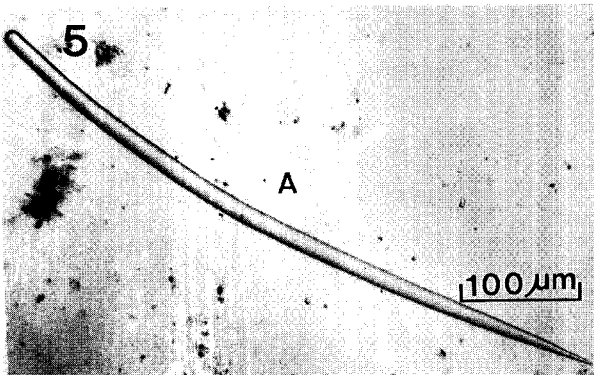
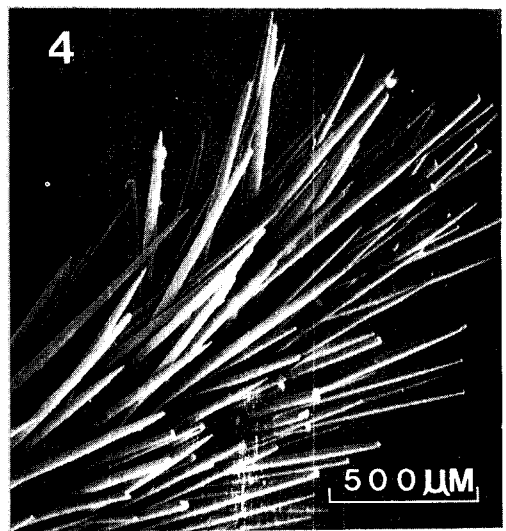
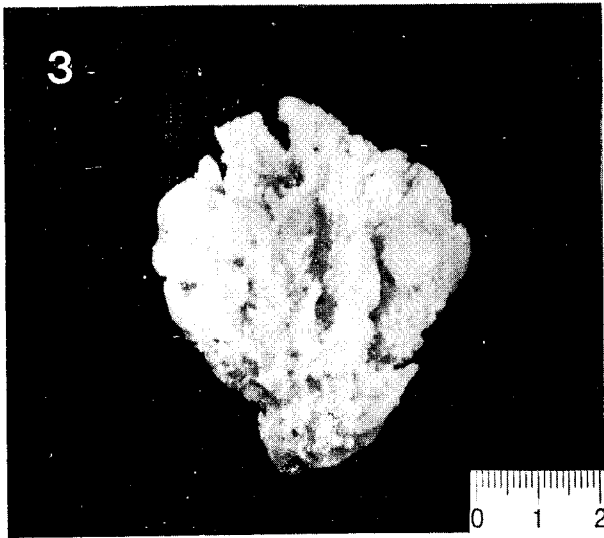
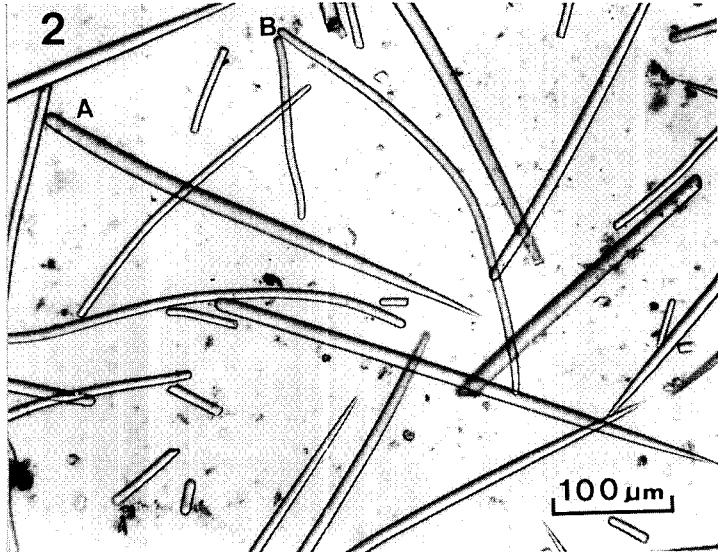


# PLATE 8





## PLATE 10



## PLATE 11

